Claims

1. (Currently Amended) A photonic material, comprising ~~a core and an envelope~~:

[[said]] a core comprising at least one nanoparticle, said nanoparticle comprising an inorganic material and at least one luminescent ion, said inorganic material suitably selected to bind said luminescent ion; and

[[said]] an envelope comprising a suitably selected organic stabilizing layer overlying said core, wherein said organic stabilizing layer comprises a functional group-presenting material having at least one functional group that binds at least one luminescent ion.

2. (Original) The photonic material of claim 1, wherein said organic stabilizing layer is suitably selected for reducing quenching.

3-4. (Canceled)

5. (Currently Amended) The photonic material of claim [[4]] 1, wherein said luminescent ion is a lanthanide ion.

6. (Currently Amended) The photonic material of claim [[3]] 1, wherein said functional group-presenting material comprises at least one ligand.

7. (Original) The photonic material of claim 6, wherein said ligand is selected to be suitable for ligand exchange reactions.

8. (Currently Amended) The photonic material of claim [[3]] 1, wherein said functional group-presenting material is a polymer.

9. (Previously Presented) The photonic material of claim 1 wherein said organic stabilizing layer is self-assembled.

10. (Currently Amended) The photonic material of claim 1 wherein said organic stabilizing layer further comprises ~~one of~~ hole conductors, electron conductors, or a suitably selected combination of hole conductors and electron conductors.

11. (Original) The photonic material of claim 10, wherein said hole conductors comprise heterocyclic compounds.

12. (Original) The hole conductors of claim 11, wherein said heterocyclic compounds are aromatic amines.

13. (Previously Presented) The electron conductors of claim 10, wherein said electron conductors are aromatic or heterocyclic compounds with suitably selected reduction potentials.

14. (Currently Amended) The photonic material of claim 13, wherein said aromatic or heterocyclic compounds are ~~one of~~ oxadiazoles, 1,2,4-triazoles, 1,3,5-triazines, quinoxalines, oligo- and polythiophenes, and oligo- and polypyrroles.

15. (Previously Presented) The photonic material of claim 1, wherein said envelope is suitably selected for preparing a sol-gel derived material.

16. (Previously Presented) The photonic material of claim 1, wherein said envelope is suitably selected for solubility in an aqueous environment.

17. (Currently Amended) The photonic material of claim [[3]] 1, wherein said envelope is suitably selected to permit modification of said functional groups.

18. (Previously Presented) The photonic material of claim 1, wherein said at least one luminescent ion is a lanthanide ion.

19. (Currently Amended) The photonic material of claim 18, wherein said lanthanide ion is selected from ~~the group consisting of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm [[and]] or Yb.

20. (Currently Amended) The photonic material of claim 19, wherein said lanthanide ion is selected from ~~the group consisting of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb [[and]] or combinations thereof such that said photonic material emits in the UV-Vis wavelength range.

21. (Currently Amended) The photonic material of claim 19, wherein said lanthanide ions are selected from ~~the group consisting of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb [[and]] or combinations thereof, such that said photonic material emits in the ~~(near-)infrared~~ near-infrared wavelength range.

22. (Previously Presented) The photonic material of claim 1, wherein said inorganic material is a semiconductor or an insulator, suitably selected to promote sensitized emissions.

23. (Original) The photonic material of claim 22, wherein said inorganic material is a semiconductor.

24. (Currently Amended) The photonic material of claim 23, wherein said semiconductor is selected from ~~the group consisting of~~ Al_2S_3, Ga_2O_3, In_2O_3, InP, GaAs, InAs, TiO_2, Ga_2X_3 ~~(X = S, Se, Te)~~, In_2X_3 ~~(X = S, Se, Te)~~, or Ln_2X_3, where [[(]]Ln = lanthanide and X = S, Se, or Te~~), TiO_2~~.

25. (Original) The photonic material of claim 24 wherein said semiconductor is Al_2S_3 and said luminescent ion is Eu.

26. (Original) The photonic material of claim 22, wherein said inorganic material is an insulator.

27. (Currently Amended) The photonic material of claim 26, wherein said insulator is selected from ~~the group consisting of~~ $LaPO_4$, $GdPO_4$, $YbPO_4$, $LuPO_4$, [[and]]LaF_3, $LaVO_4$, YVO_4, $LnPO_4$ (Ln = lanthanide or Y), $LnVO_4$ (Ln = lanthanide [[ot]] or Y), LnX_3 (Ln = lanthanide and X = Cl, Br, or I).

28. (Original) The photonic material of claim 27 wherein said insulator is LaF_3.

29. (Currently Amended) The photonic material of claim 1, further comprising a suitably selected inorganic shell for shielding said core from quenchers, said inorganic shell located between said core and said envelope.

30. (Original) The photonic material of claim 29 wherein said shell comprises a suitably selected semi-conductor.

31. (Currently Amended) The photonic material of claim 30 wherein said shell comprises a semi-conductor selected from ~~the group consisting of~~ Al_2S_3, Ga_2O_3, In_2O_3, InP, GaAs, InAs, TiO_2, Ga_2X_3 ~~(X = S, Se, Te)~~, In_2X_3 ~~(X = S, Se, Te)~~, or Ln_2X_3, where [[(]]Ln = lanthanide and X = S, Se, or Te~~), TiO_2~~.

32. (Original) The photonic material of claim 29 wherein said shell comprises an insulator.

33. (Original) The photonic material of claim 32 wherein said insulator comprises LnX_3, wherein X is a halide.

34. (Original) The photonic material of claim 32 wherein said insulator is $LaPO_4$.

35. (Original) The photonic material of claim 33 wherein said insulator is LaF_3.

36. (Currently Amended) The photonic material of claim 32, wherein said insulator is selected from ~~the group consisting of~~ $GdPO_4$, $LuPO_4$, [[and]] or YPO_4.

37. (Previously Presented) The photonic material of claim 29, wherein said shell further comprises at least one luminescent ion.

38. (Original) The photonic material of claim 37, wherein said at least one luminescent ion is a lanthanide ion.

39. (Currently Amended) The photonic material of claim 38, wherein said lanthanide ion is selected from ~~the group consisting of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm [[and]] or Yb.

40. (Currently Amended) The photonic material of claim 39, wherein said lanthanide ion is selected from ~~the group consisting of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb [[and]] or combinations thereof such that said photonic material emits in the UV-Vis wavelength range.

41. (Currently Amended) The photonic material of claim 40, wherein said lanthanide ions are selected from ~~the group consisting of of~~ Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb [[and]] or combinations thereof, such that said photonic material emits in the ~~(near-)infrared~~ near-infrared wavelength range.

42. (Currently Amended) A method of preparing a photonic material, comprising:

selecting a suitable inorganic material and a suitably luminescent ion; [[,]]

preparing [[an]] at least one nanoparticle therefrom to provide a core; [[,]] and

enveloping said core with a suitably selected organic material to provide an envelope, wherein said organic material comprises a functional group-presenting material and at least one functional group that binds the suitably luminescent ion.

43. (Previously Presented) The method of claim 42, further comprising selecting said organic material to reduce quenching.

44. (Currently Amended) The method of claim 42, wherein ~~said organic material comprises a functional group-presenting material and at least one functional group and~~ said functional groups are exchanged.

45. (Previously Presented) The method of claim 42, further comprising selecting a suitable inorganic material to provide a shell, covering said core with said shell and enveloping said shell with said envelope.

46. (New) A photonic material, comprising:

a core comprising at least one nanoparticle, the nanoparticle comprising (a) an inorganic material selected from $LaPO_4$, $GdPO_4$, $YbPO_4$, $LuPO_4$, LaF_3, $LaVO_4$, YVO_4, YPO_4, $LnPO_4$, YVO_4, $LnVO_4$, $LnCl_3$, $LnBr_3$, LnI_3, Al_2S_3, Ga_2O_3, In_2O_3, InP, GaAs, InAs, TiO_2, Ga_2X_3, In_2X_3, or Ln_2X_3, where Ln = lanthanide and X = S, Se, or Te; and (b) at least one lanthanide ion selected from Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, or combinations thereof, wherein the inorganic material binds the at least one lanthanide ion; and

an envelope comprising a suitably selected organic stabilizing layer overlying the core, wherein the organic stabilizing layer has at least one functional group that binds the at least one lanthanide ion, the organic stabilizing layer further comprising aromatic amine hole conductors, electron conductors, or a suitably selected combination of aromatic amine hole conductors and electron conductors, wherein the electron conductors are oxadiazoles, 1,2,4-triazoles, 1,3,5-triazines, quinoxalines, oligothiophenes, polythiophenes, oligopyrroles, or polypyrroles.